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The Amphibians and Reptiles of Franklin County, Kansas*

Paper 10 of the 1926 Meeting at Winfield

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From the spring of 1924 to the fall of 1927, more than 1500 specimens of amphibians and reptiles were collected in Franklin County, Kansas, by the writer and some of his students at Ottawa University. Forty-seven species and subspecies (nine amphibians, six lizards, twenty-six snakes and six turtles) are represented. While this field work was being done, observations were made on the habitats, behavior and life histories of the forms secured. Because a change in residence has been made it seems best that these notes should be published.

The region in which these studies were made consists of almost the entire area of Franklin County. The Marais des Cygnes River passes approximately from west to east across the northern half of the county, and with its many branches produces a large number of small wooded valleys with rocky hillsides and occasional limestone or sandstone cliffs ranging in height from ten to fifty feet. The only prairie of any extent is found in the southwestern portion of the county, across the southern end of a chain of highlands known as the Chipewewa Hills. Here in several places are outcroppings of sandstone. In the eastern and southern part of the county the rock formations along the streams are limestone. Along the valleys of these small streams open timber is found, the predominating trees being oak, ash, elm, and hickory with a few old cedars in the rocky bluffs. In the valley of the Marais des Cygnes it is still possible to find small marshy ponds, depressions in the flood plain, in which enough water is present most of the year to furnish breeding places for an abundance of frogs and toads. These little spots are reminiscent of the days before much of the land was brought under cultivation, when the Marais des Cygnes valley was truly a "Marsh of Swans".

Specimens of each form have been preserved in the museum of Ottawa University, and museum numbers here given, following the letters O. U. M., refer to this collection. Much of the material secured during this period, however, was exchanged or used for other purposes.

Early papers dealing with Kansas herpetology are very few in number. Mozley (1878) listed the snakes in the museum of the University of Kansas and four papers by Cragin (1881, 1884, 1885 and 1894) gave miscellaneous records on the distribution of Kansas amphibians and reptiles. None of these gave any records from Frank-

*Contribution from the Department of Biology, Ottawa University, Ottawa, Kansas. The writer wishes to thank Dr. F. Erdmann Smith, President of Ottawa University, and Dr. W. B. Wilson, head of the Department of Biology, for making it possible for him to carry on herpetological studies at that institution.

lin County. Branson in his paper on the snakes of Kansas (1904) reported from this locality sixteen species which will be referred to later. To the knowledge of the writer, no other papers on the herpetology of Franklin County or adjacent regions have been published.

No attempt has been made to discuss in detail the food habits of the species treated in this paper. Since the notes on this subject are simply records of the writer's experience in keeping many of these animals alive for various periods of time, the literature on food habits has not been reviewed. In connection with certain species about which little is known, it is believed that these incomplete studies may be of value.

For assistance in the field and laboratory the writer is especially grateful to Mrs. Leonora K. Gloyd, Mr. George W. Saip and Mr. Wilbur Doudna. Mr. Wesley Clanton assisted as a collector and contributed data for which the writer is greatly indebted. The kindness of Dr. Frank N. Blanchard, of the University of Michigan, in identifying specimens and giving many helpful suggestions while this manuscript was in preparation is greatly appreciated.

AMPHIBIANS

Most of the amphibian collecting was done at night with the aid of an acetylene head-light with a generator attached to the belt. This was found to have several advantages over various electric flashlights and gasoline lanterns which were used on certain occasions. It left both hands free for manipulating collecting apparatus and cloth bag containers. The eyes of frogs and toads reflected the light from such a source at distances from ten to fifty yards, depending upon the size of the animal. Species as small as *Hyla versicolor* were readily located at moderate distances by this means. With proper caution, avoiding floating and submerged debris and unusual splashing of the water, it was usually possible to catch the specimens by hand.

1. *Necturus maculosus* (Rafinesque). Mudpuppy; Waterdog.

Two specimens of this form were taken on trot lines in the Marais des Cygnes River April 15 and April 18. Local fishermen state that they are frequently captured in this way. O. U. M. 325, 326.

2. *Ambystoma texanum* Matthes. Texan Salamander.

This species was frequently taken in early March from shallow pasture streams which after the spring rains connect grassy pools, drying up almost completely during the summer. Eggs and newly hatched larvae were collected March 1. An adult was found in a crayfish hole near a pond May 15, another under a board October 28, and another as late as November 10. O. U. M. 301-303, 734, 735.

3. *Bufo americanus* Holbrook. Common Toad.

These toads in 1927 were first collected March 30, and a clasping pair was found among those secured. By April 4 toads were singing in full chorus in ponds and marshes. Several clasping pairs were taken, one of which deposited eggs in a laboratory aquarium April 5. Large numbers were again seen and heard April 9, although a care-

ful search for mated pairs revealed none. Young toads were undergoing metamorphosis in shallow ponds May 24 and adults were heard singing June 2. O. U. M. 142-159.

4. *Acris gryllus* (Le Conte). Cricket Frog.

The cricket frog was found to be abundant in this region and commonly seen near ponds and streams from the latter part of March to September. The earliest singing date noted was April 9. It sang more or less sporadically throughout the summer. It was collected as early as February 5 (in this case being seen through the thin ice in a small stream) and as late as December 3. O. U. M. 328-331, 341-363.

5. *Pseudacris triseriata* (Weid). Swamp Tree Frog.

The notes of the swamp tree frogs were sometimes heard during the first week of February, when they appeared as soon as a slight moderation in weather and rise in temperature permitted. Periods of cold weather sent them into shelter for a time but they promptly emerged and resumed their chorus as soon as the water temperature was slightly above freezing. Mated pairs were collected and egg masses attached to plant stems in water were observed March 6. By March 10 very large numbers were singing in every pond, creek and marsh in the vicinity. A spawning pair was observed the night of March 14. The female was clinging back downward to a weed stalk four or five inches beneath the surface of the water, the forelegs of the male clasping her in the armpits. As the eggs were extruded their gelatinous coverings adhered to the supporting stem. Mated pairs were collected April 9 and singing was still heard. On this date also a frog of this species was taken from the mouth of a large leopard frog, *Rana pipiens*. Tadpoles of the swamp tree frog were transforming May 15. O. U. M. 332-340, 786-813, 853-863.

6. *Hyla versicolor versicolor* (Le Conte). Common Tree Frog.

The earliest date on which this species was heard singing was April 9 when it was collected near Ottawa in a small cat-tail and sedge marsh bordered by a few low, overhanging trees. About twenty-five specimens were secured but comparatively small numbers were singing. They were taken from the water, where they floated on the surface or clung to partly submerged plant stems, and from the trunks and branches of trees. Singing males were found in both places. About a third of the catch proved to be females but only one clasping pair was secured. On several occasions later in the season isolated individuals were heard singing. O. U. M. 888-909.

7. *Rana areolata* Baird & Girard. Northern Gopher Frog.

This species was much more common in this region than is ordinarily supposed; its cry, if not the frog itself, being familiar to almost everyone who listens to frog voices in the spring. It was much more wary and difficult to catch than any other species of the vicinity, and perhaps this habitual shyness, and the fact that it remains quiet throughout the day and in or near its burrow all the year except

during the breeding season, may account for its being so little known. As observed in Franklin County, it began to sing about the middle of March and continued to sing a relatively short time. It was not heard after the middle of April. The earliest specimens were taken March 11 and, in 1927, it was last heard singing April 9. It occurred most often in shallow, grass-grown pools formed in pastures and meadows by standing water after spring rains. Males were usually more abundant than females. Often in a catch of twenty or thirty only one or two females were present.

The song of *Rana areolata* was most often heard after dark although on one occasion several were singing and splashing in a roadside pond about an hour before sundown. The voice of these frogs does not have the prolonged resonance of that of the bullfrog, *R. catesbeiana*, although it is almost as deep and seems to have even more carrying power. The song most frequently heard is a low-pitched, drawn-out guttural note which may be suggested by the syllables "wurr-r-r-up" accented on the last. It is repeated several times, either from the surface of the water or from the shore, at more or less regular intervals, varying in frequency. The vocal sacs of the males are lateral and relatively much larger than those of *R. pipiens*. When singing they are distended until they resemble miniature balloons, each one almost as large as the head itself.

During the height of the breeding activities the song of the male was varied considerably from what has just been described. On a few occasions, once in daylight about 6:30 p. m., and at other times between dark and midnight, two or three males were observed with vocal sacs and belly inflated, bobbing up and down and splashing about on the surface of the water, accompanying these performances by much chuckling and croaking very unlike their usual song. They floated on the surface, paddling about with their hind feet, their short legs seemingly held rigid with knee joints slightly flexed. Occasionally one would make a rush at another which would evade the plunge by deflating itself and making a sudden dive beneath the surface of the shallow water, immediately coming up only a few inches away and again participating in the same behaviour. These actions although indulged in by males only did not seem to have the nature of combat, but rather a friendly game of sport. At these times females apparently in the role of spectators, were seen at the edge of the water or higher on the bank of the pool. No observations were made of the mating or egg-laying.

Mr. Clanton found a specimen in a crayfish hole (or burrow of its own making) August 12. It was in a somewhat damp depression in a pasture more than a quarter of a mile from the nearest spawning pond.

O. U. M. 364-371, 866-872, 876, 878-887.

8. *Rana catesbeiana* Shaw. Common Bullfrog.

The bullfrog was fairly common wherever suitable habitats were available. It was collected as early as February 16. In the spring of 1927 the smaller individuals appeared first, early in March, while

the larger ones were not seen until late March and early April, and were not common until about May 1 when the song of the species was first heard. Adults were found in the larger, more permanent bodies of water although recently transformed young were collected in shallow streams, wet-weather pools and stock ponds.

O. U. M. 372-375, 382-384, 739, 779-785, 820, 821.

9. *Rana pipiens* Schreber. Leopard Frog.

Throughout the spring, summer and autumn this was the most common amphibian of this locality. It was collected as early as February 16, in 1927, and was seen on every night trip taken after that date. During that season the singing of this species became general by March 10 and continued through the months of April and May. The first clasping pairs were collected March 10 and the last, April 9.

O. U. M. 385-387, 736-738, 757-778, 819, 877.

LIZARDS

All the lizards collected by the writer have been examined by Mr. C. E. Burt in his recent study of the lizards of Kansas.*

Since a detailed study of the life history of the Five-lined Skink, *Eumeces fasciatus* (Linn.), is being made by Leonora K. Gloyd, data of such nature is not given in this paper. It is also thought best to report separately the observations on the life history of the Sonoran Skink, *Eumeces obsoletus* (Baird & Girard).

1. *Ophisaurus ventralis* (Linn.). "Joint-snake"; "Glass-snake".

This legless lizard was fairly common in this region. It was found occasionally among dead leaves and decaying matter driven by the wind into brush piles and bushes. In June, 1926, one was seen in the open crawling swiftly in short grass. It took refuge in a clump of gooseberry bushes and dead leaves and escaped. Captive specimens were observed to leave their skins entire when moulting. The cast off skins were not turned inside out as with snakes although short sections were often telescoped into each other.

Eight eggs were deposited by a captive female July 22, 1927. They were described by an assistant as similar in color and shape to those of *Eumeces fasciatus* and slightly smaller. Unfortunately they were not hatched.

Sometimes this species is referred to as "straw-snake" and "hoop-snake". Since the regeneration of a new tail produces a growth quite distinct in color from the rest of the body, which might easily be mistaken for a "horn" by the uninformed in a superficial examination, it is not improbable that the *Ophisaurus* is responsible for the local belief in the hoop-snake story. O. U. M. 295-300, 913, 926, 972, 973.

2. *Cnemidophorus sexlineatus* (Linn.). Six-lined Lizard.

Although occasionally met with, this was not a common species. A specimen was taken April 27, 1925, in the woods near the bank of the Pottawatomie River between Lane and Greeley. Three adult males were found under flat stones on a hilltop in the Chippewa

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Hills, eight miles southwest of Ottawa, May 3, 1927. O. U. M. 283, 284, 955-957.

3. *Leiopisma laterale* (Say). Ground Lizard.

This little skink was abundant in wooded country near Ottawa. It frequented wooded bluffs, both limestone and sandstone, although it seemed to be found in somewhat greater numbers near the latter. Almost every specimen was secured among leaves on or near the ground. A few were dug out of crevices in dead logs or between rocks. A gravid female which died June 9 contained five eggs. Two other females deposited eggs on June 9 and June 27 respectively. The first set numbered four eggs, three of which hatched August 21. At time of hatching the young skinks measured 40, 44 and 48 mm. in length. There were only two eggs in the second set. When laid their dimensions were 7.8x5.5 mm. and 7.5x5.5 mm. O. U. M. 251-261, 733.

4. *Eumeces anthracinus* (Baird). Coal Skink.

In Franklin County this species was found in the same habitats as *Eumeces fasciatus* although much less abundantly. It was taken occasionally in a heavily wooded sandstone region near Homewood in the southwestern part of the county. A female collected May 3, 1926, deposited eight eggs averaging 6x10 mm. in size during a period of two days, June 21-23. Six of them hatched July 24 and 25. Of the remaining two, one contained a dead embryo when laid and the other spoiled a few days later. The young skinks averaged 47 mm. in length and were black in color except for blue tipped tails and a reddish tint on the rostral, mental and labial plates. In a few days all fed upon small insects captured with a sweep net. O. U. M. 197-200, 202-206. No. 197 was identified by Dr. Frank N. Blanchard.

5. *Eumeces fasciatus* (Linn.). Five-lined Skink; Blue-tailed Skink.

This was perhaps the most abundant lizard of the region. Wooded upland country with decaying logs, wind-blown piles of brush and leaves, and loose rocks seemed to offer it most satisfactory habitats. It was more widely distributed than the preceding species, however, having been found in a greater variety of situations, sometimes on the borders of woodlands almost encroaching on the prairie. It was collected as early in the season as April 6 and as late as the middle of September. O. U. M. 207-223.

6. *Eumeces obsoletus* (Baird & Baird). Sonoran Skink.

This larger skink was found most often under stones in more or less open situations, exposed prairie hillsides or sparsely wooded pasture land. On a few occasions specimens were collected beneath stones imbedded in the earth to a depth of ten or twelve inches.

The act of copulation of this species was observed in the laboratory on April 21, 27, and May 6. Between June 11 and 13, 1925, eleven eggs were deposited in a box containing two females enroute to Michigan. It was not definitely known that these were all laid by the same individual. Because of lack of proper facilities for caring for them on such a journey none were hatched. In 1927 a set of eggs laid by a female secured by Mr. Clanton were hatched August 22. O. U. M. 226-244.

SNAKES

The snakes of the region were studied more carefully than any other group. Only two species reported by Branson (1904) were not collected. One of these, *Heterodon nasicus* Baird & Girard, the Texas or western hog-nosed snake, is a form associated with dry and sandy regions. Habitats of this sort are very scarce or entirely wanting in Franklin County. Inasmuch as Branson's Franklin County specimen cannot now be found, and since the easternmost Kansas record for this snake known to the writer is Riley County, more than a hundred miles west, it seems probable that Branson's report was an error. The other species, *Lampropeltis triangulum triangulum* (Lacepede), milk snake, is represented in the Museum of the University of Kansas by but one specimen, number 2253, from Douglas County, which adjoins Franklin on the north. Since this locality is far outside the range of that form as defined by Blanchard (1921) it is probable that the locality given for this specimen is incorrect and this subspecies should not be admitted to the faunal list of the state unless more specimens are discovered.

Notes are given (see tables at end of paper) on the scutellation of the Ottawa University Museum series of each species of snake from this locality. In the cases in which the O. U. M. series is unusually small, additional data is supplied from a few specimens in the collection of the writer (indicated by the letter G preceding the number) or from individuals which were used for exchange. It is hoped that this will give a more useful indication of the variation found in the species of this area. Lack of space makes it impractical to include scale counts of the entire O. U. M. series of *Agkistrodon mokasen*, *Crotalus horridus* and a few others. As a matter of reference, however, the museum numbers of all individuals of these series are listed.

The pit vipers, *Agkistrodon mokasen*, *Sistrurus catenatus catenatus*, and *Crotalus horridus*, are not treated in detail in this paper because they are the subjects of special studies being made by the writer.

1. *Carphophis amoena vermis* (Kennicott). Worm Snake.

The worm snake, a common species in this region, was collected in damp places beneath stones and decaying logs in both wooded and open country. None were seen in the absence of cover. A female (O. U. M. 923) taken April 28 contained four eggs which averaged 15x6 mm. in size. The tough outer egg membrane had not yet been formed and in one egg a germinal disc about 2 mm. in diameter was visible.

In the entire series examined the black dorsal color extends laterally on the third row of scales.

2. *Diadophis punctatus arnyi* (Kennicott). Ring-necked Snake.

Although this species was taken in relatively large numbers in other localities in eastern Kansas, it was surprisingly uncommon in the Franklin County region. Only five specimens were secured here in three years. These were under stones or logs on hillsides covered with open woods.

3. *Heterodon contortrix* (Linn). Hog-nosed Snake.

The harmless "blow-viper" or "spreading adder" was found occasionally in eastern Kansas although it was by no means common. Four specimens were secured in Franklin County. Two of these were very dull colored with the pattern very indistinct even just after shedding. The markings of the other two were relatively brilliant. Each was kept alive in the laboratory for several months and all fed occasionally upon frogs and toads. Only one of the four ever went through the performance of "playing dead" and turning belly upward with wide-open mouth. All soon became so accustomed to the presence of human beings that no amount of rough handling could induce them to spread their heads and hiss.

4. *Liopeltis vernalis* (Harlan). Smooth-scaled Green Snake.

Only one Kansas specimen of this beautiful little snake has been seen by the writer. This was collected in the Chippewa Hills about eight miles southwest of Ottawa, May 22, 1928, by Wilbur Doudna. It was reported from Franklin County by Branson (1904) but the specimen on which this record was based could not be found. This locality is well within the range of the species but apparently it is rare in this region.

The specimen at hand (G 707) is a male. Scale rows 15, ventrals 132, caudals 93, supralabials 7, infralabials 8, oculars 2-2, temporals 1-2, total length 465 mm., tail length 167 mm. Since the color of this specimen in life was different from that of others seen by the writer in the eastern portion of its range, a color description is here given, using the terminology of Ridgway's Color Standards and Color Nomenclature. Top and sides of head above labials forest green; back and upper sides of body and tail light elm green, sides paler on second and third rows of scales, the green color ending abruptly at middle of second row of scales; lower three fifths of rostral white, upper part same as top of head; supralabials white with very slight trace of green on upper borders; infralabials, chin shields and gulars white; lower sides of body (first scale row and lower half of second) pale greenish yellow, yellow extending faintly on outer edges of ventrals and caudals; ventrals and caudals white except for slight edging of yellow laterally; anteriorly ventrals faintly washed with yellow.

5. *Opheodrys aestivus* (Linn.). Rough-scaled Green Snake.

This species was occasionally taken among bushes and shrubbery a foot or two from the ground. One specimen was resting on a mat of dried leaves beneath a growth of sumac and dogwood, and another was raked up from beneath a bed of closely packed leaves. All that were secured were collected on a wooded rocky hillside at "Gould's Ford" on Middle Creek, seven miles southeast of Ottawa. Some that were kept alive for a time fed readily on grasshopper nymphs and crickets. On one occasion a small individual was swallowed by a larger one, presumably as the result of an attempt on the part of both to eat the same insect. Since the smaller snake was regurgitated later, it is probable that this was not an indication of cannibalistic tendencies on the part of this species.

6. *Coluber constrictor flaviventris* (Say). Blue Racer.

One of the most abundant snakes of this region was the blue racer. It was collected as early in the season as April 1 and one was seen basking on a sunny ledge on December 15. In this locality the coloration of this species is greenish gray, olivaceous or greenish blue above with underparts ranging from pale creamy white to light yellow. Individuals up to 650 mm. in length were found retaining some of the juvenile spotting.

It proved very unsatisfactory as a captive as all specimens kept alive consistently refused to eat small birds, mammals, frogs, toads, insects and earthworms.* On two occasions smaller snakes of the same species were eaten and the stomach of a small individual received from George W. Saip contained a very young "glass snake", *Ophisaurus ventralis*.

A male and female blue racer (O. U. M. 910 and 911) were found together under a stone April 4, 1927. There were not in the act of mating but this circumstance suggests the probability that they were sexually mature individuals although both showed traces of the juvenile coloration. A larger pair (1077 and 1223 mm. in length) were collected together May 12.

While walking through a growth of rather thick underbrush, sumac, scrub oaks, and tall grass one day in midsummer (July 22), the writer was startled by a zipping buzz among the dead leaves some ten feet to the left. The sound at once suggested a rattlesnake. Upon carefully looking the ground over in that direction, a very large blue racer was distinguished among the leaves and debris. Perceiving that it was observed it plunged over the edge of a nearby ravine with tremendous speed. Had it remained quiet it would have been passed unnoticed. The habit of vibrating the tail when annoyed or disturbed has been noted many times in captive individuals of this species. This incident, however, is the only occasion in the writer's experience in which it has been known to occur in the field. O. U. M. specimens not listed in the table are numbers 55-61, 120, 121, 507-510.

7. *Elaphe laeta* (Baird & Girard). Rat Snake.

Rocky hills with sunny slopes and sparse woodland growth represent the type of habitat in which this species was most frequently collected. It can not be considered of common occurrence in this locality. On a few occasions it was found under stones in company with blue racers and copperheads. As it was never seen abroad in daytime it is probable that it is more nocturnal in its habits than its relative, the pilot blacksnake, *Elaphe obsoleta obsoleta*. Living specimens fed upon white-footed mice (*Peromyscus* sp.), house mice, white rats, white mice, and English sparrows.

No adult females were taken and nothing was learned about its breeding habits or life history. A small specimen (O. U. M. 1053) taken in October is probably a young of the year.

*Captive blue racers in the writer's laboratory have recently fed upon house mice which were seized quickly and killed by being pressed down under the coils of the snake's body. In the instances observed the snakes did not coil about their prey.

8. *Elaphe obsoleta obsoleta* (Say). Pilot Black Snake.

The common "blacksnake" of this region was more or less abundant in wooded areas throughout the spring and summer. It was frequently seen among the branches of trees at heights from ten to thirty feet, basking in the sun on top of piles of brush, or stretched in graceful curves on the ground. Its movements were usually sluggish although it traveled quite rapidly when it desired. Eight specimens preparing to hibernate in a well in company with two blue racers, *Coluber constrictor flaviventris*, and a small bull snake, *Pituophis sayi*, were taken November 12, 1926. They were resting in the crevices of the rocks less than twelve feet below the surface of the ground. The well was carefully walled up and closed at the top, making the method of entrance of the snakes a matter of conjecture.

A three-foot specimen was seen in the field tightly coiled about a baby cottontail rabbit. Another when captured contained three unbroken bird eggs which it was caused to regurgitate. The eggs were entirely white and judging from their color, shape and size, probably those of the bob white.

As a rule this species was easily fed in captivity since most individuals would readily take mice, rats and sparrows either dead or alive. In different snakes, however, considerable variation in feeding habits was observed, some eating whenever the opportunity was offered and others refusing all food. One large male lived seven months without eating although food such as was eaten by others of the same species was frequently supplied. Individual temperament also varied markedly. Some were consistently nervous and cross and would not submit to being handled without struggling and biting; others were extremely gentle and would climb about one's arms and shoulders without manifestation of nervousness.

Several years before the writer began a serious study of snakes, a pair of six-foot pilot blacksnakes was kept for a few months in a laboratory cage. Just before the last of May, upon visiting the cage one night with a flashlight, the pair was seen in copulation. The act was repeated the following night and on several occasions the male was observed to attempt a renewal of such relationship but was repulsed by the female. Fourteen eggs were deposited July 30. The largest measured 56x24 mm.; the smallest 45x24 mm. A well developed living embryo was found in one egg August 17, but due to improper conditions of moisture none of them hatched. Another female deposited a set of nine eggs July 11, 1927. These were cared for by Mr. Clanton and all hatched August 22. Two of these are O. U. M. 1051 and 1052.

Newly hatched specimens had a light grayish-tan ground color and from 30 to 35 dark brown dorsal spots on the body. A series of smaller dark brown lateral spots alternated on each side with the dorsal spots. Such specimens were between 300 and 400 mm. in length. These may be confused with the young of the rat snake, *Elaphe laeta*, but can be distinguished by their smaller number of dorsal spots which are elongated longitudinally. *E. laeta* has 40 to 57 dorsal spots, transversely elongated. Several young specimens

all less than 400 mm. long were collected between May 3 and 13, 1925 and 1926. These were thought to have been hatched the preceding fall. One of these, two days after its capture, regurgitated the partially digested remains of a small white-footed mouse, *Peromyscus* sp. Many individuals between three and four feet in length still showed an easily distinguishable color pattern, and it could be traced in several that were considerably larger, especially just after shedding.

9. *Pituophis sayi* (Schlegel). Bull Snake.

This large prairie-frequenting species, common throughout most of the state, is one of the few snakes which many farmers are beginning to recognize as an ally in the struggle against injurious rodents. The potentiality of the bull snake as a rodent destroyer has been shown by work done at the Kansas State Agricultural College and Experiment Station (Hisaw and Gloyd, 1926). Although captive specimens fed occasionally upon birds and eggs, a decided preference in favor of pocket gophers, rats, mice, rabbits and ground squirrels seemed to be indicated.

Various authors state that individuals of this species attain a length of nine feet but it is not likely that any of such size have been found since the prairie regions have become more thickly settled. The largest measured by the writer had a length of 2095 mm. (6 ft. 10 1-2 in.).

A set of twelve eggs was discovered in the field August 30. They were partially imbedded in soft earth under a stone. A large female deposited two eggs July 7 but died before the remainder of the set were laid. Dissection revealed sixteen additional eggs. Another female deposited a set of ten eggs July 11. A third female collected June 16 deposited sixteen eggs July 4. They were uniform white in color, roughly elliptical in shape, and averaged 52x38 mm. in size. The egg having the greatest length measured 57x39 mm.; the shortest egg 48x38 mm.; that having the greatest diameter 56x42 mm.; that having the least diameter 53x36 mm. It can be seen from this that the shape varied considerably; the longest egg not necessarily the largest in total mass, and the shortest not necessarily the smallest. The tough leathery outer coverings adhered closely to one another holding the entire mass together with the exception of one egg which appeared to have been the last deposited.

This set of eggs was placed in a box of moist decaying wood and kept slightly damp by sprinkling with water every three or four days. They increased in size slightly during the next four or five weeks and then began to shrink and become discolored. One was opened and examined September 13, seventy-one days after the eggs were deposited. It contained a well-developed, living and very active embryo 384 mm. long. Considerable yolk was yet unabsorbed. On one side of the egg membrane where a rot or mould had eaten almost through, a gelatinous blister-like growth had formed on the inside, reinforcing the weak spot.

Six young emerged September 18, seventy-six days after the eggs were laid. The remaining eggs, with the exception of three in which the embryo died, hatched the two succeeding days, September 19 and

20. Little gashes, one-half to three-fourths of an inch long, were cut in the membranes by the "egg teeth" of the baby snakes. Each egg bore more than one cut. Sometimes the second and third were almost parallel to the first and sometimes they extended in several directions. Noses and heads protruded from the egg membranes several hours before the young snakes completely emerged. When the heads were extended even slightly any stimulus heard or felt by the little snakes caused them to be retracted.

Two days after hatching the thirteen young snakes were weighed and measured.

	5 males	8 females	13 both sexes
Average weight -----	33.41 gm.	31.06 gm.	31.9 gm.
Average length -----	424.00 mm.	412.50 mm	416.mm.

All were very nervous and vicious and would hiss and strike at the slightest provocation. At the average age of ten days the skins were shed for the first time. One took food first at the age of nine weeks when it succeeded in swallowing a very small baby rat. Three others took food of a similar nature a few days later. Eleven individuals of this brood are represented by O. U. M. numbers 740-750.

10. *Lampropeltis calligaster* (Harlan).

Yellow-bellied King Snake; Blotched King Snake.

This was the only king snake common in this locality. It was found under rocks both in open woods and on exposed hillsides. Some were taken in pastures where the short grass offered little cover, some in gardens and lawns and others crossing roads between fields. Although usually seen during the day, two were captured at night when crossing the road in the light from an automobile.

In about two dozen specimens collected in this vicinity the darker coloration predominated. Very dark individuals showing the striped effect pointed out by Blanchard (1921, pp. 118-119, fig. 40) were common. The belly coloration was usually white with small, indefinitely shaped grayish spots. Only a few had the ground color washed with a light salmon-orange tint, more intense along the midline.

Laboratory feeding experiments showed that this king snake is somewhat partial to a diet of mice. Both house mice and white-footed mice were eaten without hesitation by the majority of captive specimens. On two occasions English sparrows were eaten, one being swallowed tail first. Once a large calligaster made an attempt to swallow another of the same species. The smaller snake escaped by struggling vigorously although three attempts upon its life were made. Young white rats were consistently refused although on one occasion one was seized and killed. Mr. Wesley Clanton in the summer of 1927 fed this species on lizards, *Eumeces fasciatus* and *Eumeces obsoletus*. No evidence was obtained in confirmation of Branson's statement (1904, pp. 396-397) that cold blooded prey, such as frogs and fish, are eaten.

The yellow-bellied king snake was usually quite gentle and tractable in its behavior toward man. It seldom became angry enough to use its teeth when being handled. When this occurred, however, it

seized the hand or wrist and chewed vigorously. Its power of constriction was shown quite strikingly when a small specimen less than two feet long killed by means of its body coils a large brown rat (*Rattus norvegicus*) which had been placed in the cage to be eaten by some larger snakes.

No eggs of this species were obtained. Four newly hatched young (C. U. M. 423-426) which seemed to be no more than two or three days old, judging from the condition of the egg membranes from which they had emerged, were received from a farmer August 21 without any data as to where or when they were discovered. Three were females and one a male. Their lengths in millimeters were as follows: 273, 269, 275, and 280.

11. *Lampropeltis getulus holbrooki* (Stejneger). Speckled King Snake.

The "salt and pepper snake", as this king snake is sometimes called, was fairly common although less often seen than *Lampropeltis calligaster*, as it appeared to be more secretive in its habits. It was collected beneath stones, fallen trees and under piles of decaying bark. One large and handsome specimen was dug out of the ground by the writer's father while spading in his garden.

Most specimens were black finely spotted with bright yellow above, the size of the spots varying slightly with different individuals. In practically all specimens examined groups of yellow spots were arranged to form more or less distinct transverse bars at regular intervals.

This species showed more aggressiveness in its feeding habits and more tendencies toward cannibalism than any other snake studied. Those kept alive fed upon mice, dead or alive, English sparrows, lizards (*Eumeces fasciatus*) and other snakes. One, when placed temporarily in a cage with other species, promptly seized a *Lampropeltis getulus boylii* and almost killed it before attention was brought to the performance. Another ate a *Lampropeltis calligaster* nearly as large as itself, another killed and swallowed a *Lampropeltis triangulum sypila*, and still another fed upon its own species. A specimen directly from the field had eaten five or more bird eggs resembling those of the bob white. Toward man these snakes seemed very friendly. They struggled very little when captured and could be handled carelessly without their becoming angry or alarmed.

A female in the museum laboratory deposited ten eggs June 22 sometime before 1:00 p. m. When first noticed five had become white and opaque but the remaining five were still soft and translucent. Upon further contact with air they gradually became like the others. Their average length was 37 mm. and average diameter 18 mm. Five soon shriveled and no development could be detected when their contents were examined. The embryos of three others were dead ten days later. Two weeks after deposition the remaining two had decreased in length and increased in diameter and one showed a decided swelling on one side. A slit about 7 mm. long was

noticed on one egg August 24. This opening was lengthened the following day and two days later a very active little snake emerged. It caused its tail to vibrate energetically whenever approached. In appearance it was unusually "plump" because of the large amount of unassimilated yolk. Two days after hatching it shed its skin. The other egg was cut August 27 and hatched the following day. Both individuals were males; lengths 270 and 202 mm.; the tail lengths 38 and 30 mm.

12. *Lampropeltis triangulum sypila* (Cope). Red Milk Snake.

This king snake appeared to be rare in this vicinity. Only six specimens were secured. All were collected under stones in open woods. One was beneath a deeply imbedded sandstone rock, eight inches below the surface of the ground. It was extremely nervous and vicious, setting its tail in vibration whenever anyone came near and often attempted to bite when handled. It fed twice upon lizards. *Eumeces fasciatus* and *Leiolopisma laterale*, but escaped from the building before its scales were recorded. Others in captivity ate lizards of the species mentioned and one swallowed a small water snake, *Natrix grahamii*. During the summer of 1927 a small specimen of Mr. Clanton's fed several times upon baby mice, small five-lined skinks, *Eumeces fasciatus*, and worm snakes, *Carphophis amoenus* vermiformis. Another of Mr. Clanton's specimens collected May 29 deposited six eggs July 3. They averaged 35x10 mm. in size and were not hatched.

13. *Natrix grahamii* (Baird & Girard). Graham's Water Snake.

This species occurred about creeks, ponds and sloughs. Its behaviour was gentle and inoffensive, even timid. Captives fed greedily upon small fish and frogs. Several were collected at night April 9, and on this occasion three were seen tightly rolled up in a bell-like mass although it was not determined whether or not they were mating.

14. *Natrix rhombifera* (Hallowell). Diamond-backed Water Snake.

Small lakes, marshes and ponds, rather than streams were the habitats which this large, vicious water snake most often frequented. Most individuals struggled fiercely when captured and were always ready to use their long teeth if given a chance. After being near people in the museum for a few days they submitted to being handled carefully although they permitted no liberties. They fed voraciously upon fish, frogs and frog tadpoles, but always refused warm-blooded animals. Dead fishes and frogs were eaten with no hesitation. If only one frog were available the snake which seized it first would often be set upon by all the others in the cage and a general melee would follow. After the frog was swallowed each snake would move rapidly about the cage searching in every corner, all of them quivering with excitement.

Late in the afternoon of May 6 three or four medium-sized *N. rhombifera*, two of which when captured proved to be males, were seen in close contact with a much larger individual which was doubtless a

female. Since they were encountered suddenly there was no time for the observer to conceal himself and the snakes quickly took alarm. The female escaped. It is probable that the males were attempting to copulate with the female. Mr. Clanton saw a pair in coitu May 15.

A gravid female which died from injuries received when captured was brought to the museum July 29. Dissection showed the presence of twenty-five eggs, most of which contained living embryos. Eleven were in the left oviduct and fourteen in the right. Another female (O. U. M. 1023) collected July 13, 1927, and kept by Mr. Clanton, gave birth to 34 young Nvoember 8. Fifteen of these are O. U. M. numbers 1024 to 1039.

Chin shield tubercles, which are considered a secondary sexual characteristic, were present on all males examined except O. U. M. 440.

15. *Natrix sipedon sipedon* (Linn.). Common Water Snake.

No other water snake was as abundant in the Franklin County region as this species. It occurred commonly about creeks, rivers and small ponds and was less often seen in marshes or swampy places. Its demeanor was less aggressive than that of the diamond-backed water snake although in captivity many of its habits were similar. It fed upon fishes, frogs and tadpoles and was as greedy as *N. rhombifera* in regard to appetite. It also refused to be interested in warm-blooded animals as food.

This species was seen mating May 15 and a large female dissected August 25 contained thirty-six young which probably would have been born within a few days since practically all of the yolk in each egg was absorbed. Of this number 19 were in the left oviduct and 17 in the right.

16. *Natrix sipedon transversa* (Hallowell). Blotched Water Snake.

This form was less common than the preceeding and its habitats were somewhat different. While occasionally taken in the streams it was in most cases found in marsh and swamp land and on several occasions individuals were discovered in upland habitats. One was sunning itself on a pile of brush in a woodlot several hundred yards from water. In captivity its food habits were similar to those of *Natrix sipedon sipedon*.

17. *Storeria dekayi* (Holbrook). DeKay's Snake.

Specimens of this small inconspicuous reptile were taken among leaves, under stones, and in decaying logs in open woods. Two were found in the near proximity of water. Rarely were individuals seen crawling in the open. Those kept alive fed regularly on earthworms and slugs but did not eat small insects, ant larvae and spiders. Sometimes the little snakes would not eat unless an end of an earthworm was placed between their jaws with a pair of forceps. Once started the worm was eagerly swallowed, some of the smaller specimens eating worms closely approaching their own lengths.

18. *Storeria occipito-maculata* (Storer). Red-bellied Snake.

Both color phases of this interesting little snake were found in Franklin County. The majority of the specimens secured were dark bluish slate or blackish plumbeous above with two dark dorsal lines. Each dark line was made more prominent by the presence of a row of fine, closely placed white spots along the side nearest the midline. Another row of similar white spots was laterally placed between the first and second scale rows. About one-third of the total number of specimens taken were of a cinnamon-brown color above with the longitudinal striping very indistinct. The scutellation was similar in all cases and the undersides were uniformly red. Occipital spots were present in all, but less distinct in the brown individuals.

This species was most common in the sandstone woods of the southwestern part of the county and was found under rotten logs, among leaves and under boards. Two of the brown phase were basking in the sun on the smooth brown clay of a dry stream bed. A bluish gray specimen was captured while crossing an open space on a large bed of *Polytrichum* and *Usnea*.

In the laboratory few of these snakes were persuaded to feed. Some occasionally ate earthworms.

A gravid female collected May 1 died July 24. It contained seven embryos, three in the left oviduct nearest the cloaca and four in the right oviduct anterior to these.

19. *Virginia valeriae elegans* (Kennicott). Ground Snake.

Only two specimens of this species were taken. Both of these were collected May 9, 1926, in the heavily timbered sandstone woods near the village of Homewood. They were secured by raking through thick piles of dead leaves. They lived for several weeks in the laboratory and each fed upon earthworms. In both specimens the following scale data is the same: scale rows 17, supralabials 6, infralabials 6, oculars 0-2, temporals 1-2. O. U. M. 465, male, has 123 ventrals, 43 caudals, total length 231, tail length 48. The color was uniform light brown above and lighter below. No dorsal spots were present. O. U. M. 466, female, has 132 ventrals, 34 caudals, total length 224, tail length 33. In color it was like number 465 except that it had four longitudinal series of small dark spots, one series at each side of the midline and the others lower down at about the fourth row of scales.

The taking of these two individuals extends the known range of this species some distance to the northwest of the localities from which specimens were examined by Blanchard in his recent revision of this genus (1923).

20. *Tropidoclonion lineatum* (Hallowell). Line Snake.

More of these little snakes were taken in the fall than in the spring. One was found in the blue grass of the college campus, another was taken while crossing a sidewalk, and others were concealed beneath stones, boards and debris. One was discovered in a crevice of a

wooden post about ten inches below the surface of the ground February 25.

Very little was learned about the habits of this shy and gentle species. Those studied alive ate earthworms, some taking them eagerly and often. A newly born dead *Tropidoclonion* was found in one of the boxes July 25, 1926. It was the aborted offspring of a female (O. U. M. 467) collected November 5, 1925. It measured 82 mm. in length and its tail length was 11 mm. This seems to indicate that mating in this species sometimes occurs in the fall as no males occupied the same box after the month in which this specimen was collected.

21. *Thamnophis sauritus proximus* (Say). Western Ribbon Snake.

In early spring the ribbon snake was common about ponds and marshes although not as abundant as *Thamnophis sirtalis parietalis*. About a dozen were collected at night April 9 in a marshy pond a few hundred yards from the Marais des Cygnes River. They were resting on the tops of bushes and weeds just above the surface of the water and feeding upon the small frogs (*Pseudacris triseriata* and *Hyla versicolor*) which were to be found everywhere in the pond. When approached with the acetylene headlight they made no effort to escape but submitted to being picked up gently and placed in the collecting bags. In the laboratory they seemed always hungry and ate small fish, frogs and tadpoles.

A gravid female (O. U. M. 474) was collected July 23 under a stone in open pasture land among sparse growths of sumac, coralberry and mullen. Four days later eight young were born. They averaged 238 mm. in length, the largest measuring 248 and the smallest 227 mm.

22. *Thamnophis radix radix* (Baird & Girard). Plains Garter Snake.

This species was common in town about dooryards, gardens and parks, as well as in the country where it was taken in woods and pastures, under stones on wooded hillsides, and in almost every habitat suitable for snakes. The food eaten by captive specimens was similar to that of the ribbon snake although many individuals were somewhat more timid about taking fish or frogs from the forceps or one's fingers.

Only one gravid female was kept until her young were born. This specimen was collected June 2. Thirteen young were born August 6; two were dead when discovered and one of these was still coiled within the foetal membranes. At the age of six days the remaining eleven averaged 187 mm. in length.

23. *Thamnophis sirtalis parietalis* (Say). Red-barred Garter Snake.

In habitat preference this form appeared to be similar to the plains garter snake, *Thamnophis radix radix*, although it was seen more often in the lowlands. On several occasions it was taken near ponds and small streams. One was collected at night while swimming across an open space between the sedges in a small marsh.

Captives of the red-barred garter snake did not feed as readily as other species. Some took frogs, small fish and tadpoles but others showed no disposition to eat.

A female collected July 22 gave birth to fourteen young August 8. Of these the last two or three to be born appeared between 8:00 and 9:00 a. m. Four were dead when discovered. The ten which lived at the age of five days averaged 193 mm. in length, extremes in size being 185 and 203 mm.

24. *Agkistrodon mokasen* (Beauvois). Copperhead.

Copperheads were found on rocky hillsides in several localities in Franklin County but by far the most abundantly in the wooded hills on Middle Creek near Gould's Ford, seven miles southeast of Ottawa. Here the rocky bluffs were unsuited for pasture and little frequented by human beings. Deep crevices furnished ideal hibernating quarters and the ledges made suitable places for basking in the sun. In early spring when snakes were just coming out of hibernation, a search beneath the loose slabs of rock along these ledges was always fruitful. Twenty-eight copperheads were collected in this area the afternoon of April 30, 1926, in a little more than three hours time. Gravid females were secured during the latter part of August in 1925, 1926 and 1927.

A form of the white-footed mouse, *Peromyscus* sp., was found here in some numbers and is thought to form a considerable item in the food of these snakes. One accidentally killed in the field had eaten several soft bodied Cicadas which had just transformed from the nymph stage. Captive copperheads ate small white rats, white mice, house mice, small brown rats, white-footed mice and English sparrows. None showed the slightest interest in fish or frogs.

Twenty-seven Franklin County specimens of the copperhead are preserved in the O. U. M. collection. In addition to those listed in the table of scale data, O. U. M. numbers for this species are 48-50, 518, 519, 521-523, 525-529, 531-534, 1014, 1015.

25. *Sistrurus catenatus catenatus* (Rafinesque).

Massasauga; Pigmy Rattlesnake.

Three specimens of this small rattlesnake were secured. A small individual believed to be a young of the year was found in a potato field September 11, 1925. It escaped from the laboratory before it was measured. The other two were taken in a meadow May 30 and June 9, 1926, respectively. In each case attention was attracted to the snake by the barking of a small dog. Both of these snakes fed on house mice and white-footed mice and one ate a very small cottontail rabbit. Another specimen in the O. U. Museum collection (No. 75) was taken in 1888.

26. *Crotalus horridus* (Linn.). Timber Rattlesnake; Banded Rattlesnake.

The timber rattlesnake was almost abundant in the Gould's Ford region mentioned in the account of the copperhead. These two spe-

cies were very intimately associated. On several occasions they were found together under the same protecting rocks. One flat stone three feet in diameter sheltered three rattlesnakes, four copperheads, and two blue racers. At the same time the twenty-eight copperheads were collected, April 30, 1926, twenty-three rattlesnakes were secured. In April and May, 1925, five specimens were taken in this locality; in 1926, thirty-two; in 1927, six; and April 23, 1928, the writer visited the place again and secured eight. Eight were taken in October, 1926, and three in the same month of 1927.

No one place formed the "den" of these snakes. They were scattered along two wooded hillsides, each with a southern exposure, although a few were encountered on the north sides of these same hills. They became scarce each year after the middle of May when they moved out into the fields and lowlands. Local residents reported killing several in fields and along hedge rows during the summer months. Toward the last of September and up to the middle of October they were found in the rocks again.

This rattlesnake was extremely gentle in captivity and even in the field its mild demeanor was noticeable. The writer stepped directly over the largest specimen taken in this region while it was coiled on a sunny spot in a path to the top of the bluff. It made neither sound nor movement and was not discovered until a few moments later. When captured it struggled fiercely. In the museum some individuals fed more regularly and eagerly than others. White rats, white mice, house mice, white-footed mice, baby cottontail rabbits and English sparrows were eaten.

Franklin County specimens in the O. U. M. collection not listed in scale data table are numbers 71, 72, 551, 552, 556, 558-561.

TURTLES

Because of the lack of proper facilities no special effort was made to collect turtles. Neither were detailed life history studies attempted.

1. *Chelydra serpentina* (Linn.). Snapping Turtle.

In ponds, creeks and marshes and in the Marais des Cygnes River the snapping turtle was collected on several occasions. An eight-inch specimen was found partially covered with mud in the bottom of a small pasture creek February 17. Small individuals were brought to the museum on numerous dates throughout the spring and summer. They fed on crayfish and scrap meat.

A medium-sized female began laying eggs July 22 and deposited fifteen between that date and August 3. The following table shows the relation between the number of eggs and the days when they were laid.

Date	number of eggs laid
July 22	1
25	1
26	1
27	1
28	2
29	4
30	1
31	3
August 3	1
<hr/>	
Number of days 12	Total eggs 15

The eggs were not quite spherical. They averaged 28.1x28.4 mm. in diameter. Only two hatched. The young turtles, with a dull yellow bulb of yolk still outside the body and attached to the middle of the posterior half of the plastron, emerged October 7. O. U. M. 92, 97-99, 115-117.

2. *Terrapene ornata* (Agassiz). Western Box Turtle.

Aside from numerous individuals seen along the highways this species occurred in considerable abundance in pastures, meadows and open woods. Several were found in burrows in the ground, some under stones and one beneath a rotten log.

A captive pair was observed mating May 11 and another May 12. In an inclosure in which between two and three dozen box turtles were kept, four eggs were discovered July 30. They had been crushed by the movements of the crowded animals. All females were removed and kept separate for a few weeks. Only one produced eggs, perhaps the same one which laid the original four. The first egg definitely known to be from this female was deposited August 2. Another was laid August 3 and a third the following day. They were elongate-elliptical in shape with much thinner shells than those of *Chelydra serpentina*. Their measurements follow: 36x24 mm., 37x22 mm., 36x23 mm. O. U. M. 104-107, 756, 1048, 1049.

3. *Graptemys geographica* (Le Sueur). Map Turtle.

Dr. W. B. Wilson collected a large individual of this species at Half-circle Lake between Ottawa and Pomona March 11, 1926. A smaller specimen was taken by the writer in the Marais des Cygnes River near Ottawa September 21, 1926. These specimens were identified by Dr. Frank N. Blanchard. O. U. M. 76, 873.

4. *Chrysemys marginata bellii* (Gray). Bell's Turtle.

Bell's turtle was the most common water turtle of the region. It was collected or seen in marshy ponds, creeks and rivers on numerous occasions. Some that were kept in a tank in the museum fed on crayfish and small pieces of meat. O. U. M. 80, 84, 85, 91, 108-110.

5. *Pseudemys elegans* (Wied). Red-eared Turtle; Cumberland Terrapin.

Two specimens of this form were taken by Mr. Clanton. They were secured in a small branch of Middle Creek in the southeastern part of the county June 13, 1926, and May 14, 1927, respectively. O. U. M. 113, 1047.

6. *Amyda spinifera* (Le Sueur). Spiny Soft-shelled Turtle.

While it was reported that soft-shelled turtles occur frequently in the streams of this region only one came to the notice of the writer while at Ottawa University. This specimen was taken in the same locality as the *Pseudemys elegans* above mentioned, June 13, 1926. It was kept alive for several weeks and fed often on crayfish and scraps of meat. Two other representatives of this species collected several years previously are in the O. U. M. collection. O. U. M. 81, 82, 114.

References to Literature

- Blanchard, Frank N. 1921 A revision of the king snakes: genus *Lampropeltis*. U. S. Nat. Mus. Bull. 114, vi & 260 pp., 75 figs.
 ----- 1923 The snakes of the genus *Virginia*.
 Papers of Michigan Acad. Sci., Arts and Letters, Vol. 3, pp 343-365, 15 figs., 2 tables.
 ----- 1925 A key to the snakes of the United States.
 Canada and Lower California. Papers of Michigan Acad. Sci., Arts and Letters, vol. 4, pt. 2, pp. 1-65, 78 figs.
 Branson, Edwin B. 1904 The snakes of Kansas. Univ. Kansas Sci. Bull., vol 2, no. 13, pp. 353-430, 39 figs.
 Cragin, F. W. 1881 A preliminary catalog of Kansas reptiles and batrachians. Trans. Kansas. Acad. Scie., vol 7, pp. 114-123.
 ----- 1884 Recent additions to the list of Kansas reptiles and batrachians, with further notes on species previously reported. Bull. Washburn Lab. Nat. Hist., vol 1, 100-103.
 ----- 1885 Second contribution to the herpetology of Kansas, with observations on the Kansas fauna. Trans. Kansas Acad. Sci., vol 9, pp. 136-140.
 ----- 1894 Herpetological notes from Kansas and Texas. Colorado College Studies, vol 5, pp. 37-39.
 Hisaw, F. L. and Gloyd, H. K. 1926 The bull snake as a natural enemy of injurious rodents. Jour. Mammalogy, vol. 7, no. 3, pp. 200-205.
 Mozley, Annie E. 1878 List of Kansas snakes in the museum of the Kansas State University. Trans. Kansas Acad. Sci., vol 6, pp. 34-35.
 Ridgway, Robert 1912 Color standards and color nomenclature. Washington, pp.iii plus 43, 53 pls.
 Stejneger, Leonhard and Barbour, Thomas 1923 A check list of North American amphibians and reptiles, 2nd ed., x plus 171 pp., Cambridge.

Explanation of Tables

In the following tables the number of longitudinal scale rows of each specimen is taken in three places; a short distance posterior to the head, near the middle of the body, and just anterior to the anal region; e. g., 21-19-17. The total number of ventrals (gastrosteges), caudals (urosteges), and labials is given in each case. The number of preoculars is followed by a number of postoculars; e. g. 1-2. Temporals of the first and second (or third) rows are indicated by two (or three) numbers; e. g., 1-3 (or 2-3-4). Whenever two figures are given for labials, or two series of figures for oculars or temporals, the first refers to the left side of the head. A single number, or series, indicates that both sides are the same. Whenever the figures for certain characters are the same in each specimen in the series, they are given in condensed form immediately following the table for each species. All measurements are given in millimeters. A plus sign after the number of caudals or measurements of length indicates that a part of the tail has been lost.

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TABLES OF SCALE DATA ON SNAKES

1. *Carphophis amoena vermis* Kennicott).

O.U.M. NO.	Date	Sex	Ventrals	Caudals	Infra-labials	Temporals	Total length	Tail
64	April '23	♂	137	36	5	1-1:1-2	200	32
129	" '24	♀	139	27	6	1-2	145	16
135	May 11, '24	♂	129	36	6	1-2	265	48
136	May 11, '24	♀	145	27	5	1-1	135	15
388	May 16, '26	♀	143	27	6	1-1	301	36
389	July 10, '26	♀	143	27	6	1-1:1-2	159	20
390	Sept. 21, '26	♂	137	35	6	1-2	139	23
923	April 28, '27	♀	141	29	6	1-2	314	42

Scale rows 15; supralabials 5; oculars 0-1.

2. Diadophis punctatus arnyi (Kennicott).

O.U.M. No.	Date	Sex	Ventrals	Caudals	Total length	Tail
---	May 17, '25	♀	167	43	360	57
---	Apr. 18, '26	♀	172	39	406	58
921	Apr. 28, '27	♂	157	48	161	32
---	Apr. 29, '27	♂	152	45	291	58
922	Apr. 29, '27	♂	152	44	275	53

Scale rows 17-15; supralabials 7; infralabials 8; oculars 2-2; temporals 1-1

3. Heterodon contortrix (Linn.).

O.U.M. No.	Date	Sex	Vent- rals	Caud- als	Supra- labials	Ocul- ars	Temp- orals	Total length	Tail
53	Sept. 10, '25	♂	130	45	8-9	10	3-4	761	142
---	May 16, '26	♂	131	51	8	11	4-4	687	132
---	Apr. 28, '27	♂	132	52	8	12-11	4-4	667	140

Scale rows 25-19; infralabials 10.
 † In this species pre- and postoculars are not differentiated; a series of small scales encircle the eye beneath the supracular.

4. Liopeltis vernalis (Harlan). (See discussion of this species in text.)

5. Opheodrys aestivus (Linn.).

O.U.M. No.	Date	Sex	Vent- rals	Caud- als	Infr- labials	Ocul- ars	Total length	Tail
11	Aug. 9, '21	♂	160	111+	8	1-2	733+	252+
G 6	Sept. 13, '25	♀	155	98+	7	1-2	361+	110+
---	Apr. 26, '26	♂	158	125	8	1-2	450	168
---	Oct. 30, '26	♀	160	121	6-7	1-2	229	80
G 70	Apr. 27, '27	♀	157	115	6	1-2	558	193
G 71	Apr. 28, '27	♀	159	121	8+7	1-2	537	196
G 72	Apr. 28, '27	♂	156	119	6	2-2	564	205

Scale rows 17-15; supralabials 7; temporals 1-2.

6. Celuber constrictor flaviventris (Say).

O.U.M. No.	Date	Sex	Ventrals	Caudals	Supra-labials	Infra-labials	Oculars	Temporals	Total length	Tail
402	Apr. 17, '26	♂	171	89	6-7	7	2-2	2-2-2	1004	262
403	Apr. 17, '26	♂	175	90	7	7-8	2-2	2-2-2	867	218
404	Apr. 17, '26	♂	173	90	8	8	2-2	{2-2-4} 3-3-3}	817	204
405	Sept. '26	♂	172	83	7	8	1-2	2-2-2	1027	238
910	Apr. 4, '27	♀	175	72	7	8	1-2	2-3-2	600	131
911	Apr. 4, '27	♂	179	83	7	8	1-2	1-2-2	651	160

Scale rows 17-15.

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11. Lampropeltis getulus holbrooki (Stejneger).

[illegible]

12. Lampropeltis triangulum sypsil (Cope).

[illegible]

13. Natrix grahamii (Baird & Girard).

[illegible]

14. Natrix rhombifera (Hallowell).

C.U.M. No.	Date	Sex	Scale rows	Vent- rals	Caud- als	Infra- labials	Ocul- ars	Temp-	Total	Length	Tail
436	Apr. '26	♀	24-23-21	142	59	11	2-3; 1-3	1-2-3	1110		232
437	May 16, '26	♂	25-25-21	140	71	11	1-3	1-2-2	835		216
438	May 29, '26	♀	26-26-21	139	60	11	1-3	1-3	1052		225
439	May 29, '26	♂	27-27-21	138	50+	10	1-3	1-2-1	785+		145+
440	May 29, '26	♂	25-23-20	141	69	11	1-3	1-2-1	673		164
Supralabials 8.											

15. Natrix sipedon sipedon (Linn.)

[illegible]

16. Matrix sipedon transversa (Hallowell).

[illegible]

170 Storeria dekayi (Holbrook).

O.U.M. No.	Date	Sex	Ventrals	Caudals	Supra- labials	Infra- labials	Oculars	Temporals	Total length	Tail
G 5	Nov. 4, '22	im.	122	56	6-7	6-7	2-2;1-3	1-1	108	27
459	Oct. '25	♀	129	45	6	6	1-2	1-3	280	53
460	Apr. 15, '26	♂	122	68	7	5	1-2	1-2	192	45
461	Apr. 29, '26	♂	129	53	6	6	1-2	1-3	293	67
924	Apr. 27, '27	♂	127	57	7	7	1-2	1-2;1-3	197	48

Scale rows 17.

18. Storeria occipito-maculata (Storer).

O.U.M. No.	Date	Sex	Ventrals	Caudals	Oculars	Temporals	Total length	Tail
9	May 3, '25	♀	125	45	2-2	1-1	234	48
10	May 3, '25	♀	126	47	2-2	1-1	215	46
452	May 9, '26	♀	123	8+	2-2	1-2	187+	9+
463	May 9, '26	♀	131	48	2-2	1-2	238	51
464	May 16, '26	♂	121	55	2-1	{1-2-2} {1-1-2}	262	69
---	May 23, '26	♂	120	51	2-2	1-2	221	55

Scale rows 15; supralabials 6; infralabials 7; unnumbered specimen, brown phase.

19. Virginia valeriae elegans (Kennicott). (See discussion of this species in text.)

20. Tropidoclonion lineatum (Hallowell).

[illegible]

21. Thamnophis sauritus proximus (Say).

O.U.M. No.	Date	Sex	Ventrals	Caudals	Supra- labials	Infra- labials	Temporals	Total length	Tail
472	Apr. 18, '26	♂	169	50+	9-8	10	1-3	504+	95+
473	May 22, '26	♀	169	94	8	10-9	1-2-3	383	106
474	July 23, '26	♀	169	95	8	10	1-2-2	602	167
475	July '26	♀	166	86	8	10	1-2-3	545	150
485	June 6, '26	♀	164	96	8	10	1-2-2 1-2-3	654	176
914	Apr. 9, '27	♀	165	97	8	10	1-2-2	722	202
915	Apr. 9, '27	♀	169	25+	8	10	1-2-3	670+	68+
916	Apr. 9, '27	♂	156	36+	8	10	1-2-3	505+	72+
917	Apr. 9, '27	♀	160	94	8	10	1-2-2	745	206

Scale rows 19-17; oculars 1-3.

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22. Thamnophis radix radix (Baird & Girard).

O.U.M. No.	Date	Sex	Scale rows	Ventrals	Caudals	Supra-labials	Infra-labials	Total length	Tail
486	May 4, '26	♀	19-21-19-17	154	57	8	10	488	97
487	May 13, '26	♀	19-21-19-17	149	69	7-8	9	658	144
491	Nov. 26, '26	♀	21-19-17	152	74	8-7	9	317	78
912	Apr. 19, '27	♂	19-21-19-17	161	78	8-6	10-9	552	126
1013	May 23, '27	♀	19-21-19-17	150	71	7	10-9	474	114
G646	May 21, '28	♂	19-19-19-17	154	66	7	10	545	125
G647	May 21, '28	♀	21-19-17	154	67+	8-7	10	545	103
G648	June 4, '28	♀	19-21-19-17	150	28+	7	10	630+	75+

Oculars 1-3; temporals 1-2-3.

23. Thamnophis sirtalis parietalis (Say).

O.U.M. No.	Date	Sex	Scale rows	Ventrals	Caudals	Temporals	Total length	Tail
30	June 30, '21	♀	19-17	154	74	1-2-3	459	114
---	Oct. 29, '24	♂	19-17	157	79	1-2	523	138
497	Aug. 14, '26	♀	21-19-17	153	81	{1-3-3} {1-2-3}	613	164
498	Aug. 13, '26	♀	21-19-17	152	75	1-2-3	695	168
499	Aug. 21, '26	♂	21-19-17	153	37+	1-2-3	427+	64+
918	Apr. 9, '27	♂	19-17	163	89	1-2; 1-3	560	148

Supralabials 7; infralabials 10; oculars 1-3.

24. Agkistrodon mokasen Beauvois.

O.U.M. No.	Date	Sex	Scale rows	Ventrals	Caudals	Supra-labials	Infra-labials	Oculars	Total length	Tail
513	Aug. 22, '25	♀	23-21	149	32-11*	8	10	2-4	570	73
514	Aug. 22, '25	♀	23-19	149	33-13	8	10	2-4	620	78
515	May 7, '26	♂	24-23-20	145	32-14	7	10	2-4	628	97
516	May 7, '26	♂	24-23-19	146	34-15	7-6	9	2-4	603	87
517	May 7, '26	♀	25-24-20	142	31-13	?	11-10	2-5	469	65
520	Apr. 30, '26	♀	24-23-19	143	26-20	8	10-9	2-5	447	62
524	Apr. 30, '26	♂	25-23-19	146	27-18	8	10	2-4	492	76
530	Apr. 30, '26	♂	27-23-20	148	24-23	8	10	2-4	662	95
1014	June 3, '27	♀	28-23-19	150	24-19	6	9	2-4	393	52
1015	June 3, '27	♂	26-23-21	147	30-16	8	9-10	2-3	728	97

*In this species the caudals toward the tip of the tail are divided.

25. Sistrurus catenatus catenatus (Rafinesque).

O.U.M. No.	Date	Sex	Scale rows	Ventrals	Caudals	Supra-labials	Infra-labials	Total length	Tail
75	1888	♂	30-27-20	153	26	12	13	580	52
537	May 30, '26	♂	25-27-20	145	29	11	14	656	77
538	June 9, '26	♂	24-23-18	145	33	12	13	713	87

Oculars 2-4.

26. Crotalus horridus (Linn.).

O.U.M. No.	Date	Sex	Scale rows	Ventrals	Caudals	Supra-labials	Infra-labials	Total length	Tail
51	May 13, '25	♂	27-23-19	174	24	14	15	1150	81
553	Apr. 30, '26	♂	26-22-19	171	26	14	16	576	47
554	Apr. 30, '26	♀	24-23-19	175	21	14-13	16-15	732	51
555	Apr. 30, '26	♀	26-23-19	174	18	14-15	15-16	714	45
557	Apr. 30, '26	♀	24-23-19	172	19	14-15	15	631	43
562	Apr. 30, '26	♂	26-23-19	167	23	13-14	15	725	60
563	Apr. 30, '26	♂	26-23-19	170	23	15-13	14-15	775	61
564	Apr. 30, '26	♂	26-23-19	172	25	14	15	853	74

Oculars 2-5.